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(71) Applicant ICO Services Ltd.

London W6 9BN (GB)

(72) Inventors

- Lundberg, Olof Ingemar  
Weybridge, Surrey, KT13 0JW (GB)

• Goerke, Thomas

Stanmore, Middlesex, HA7 3PN (GB)

(74) Representative:

Read, Matthew Charles et al

Venner Shipley & Co.

20 Little Britain

London EC1A 7DH (GB)

(54) Providing web access to users in a vehicle

(57) Internet access is provided to passengers in a vehicle such as an aircraft through a proxy server (10) which has access terminals (T1 - n) for passengers' lap top computers or personal organisers (UT1-n). The proxy server (10) can be connected through a satellite link (2, 3) to a ground-based land station (5) connected to the Internet. In order to minimise use of the wireless link (2, 3), the proxy server, whilst the aircraft is stationary, is loaded with most frequently used web pages from a ground-based server (15), connected through terminals (14, 16) and a wired link (13). The downloaded web pages may be selected according to the destination of the journey. E-mail messages produced by the passengers may be temporarily stored until the aircraft lands and then downloaded to the server (15) for onward transmission.

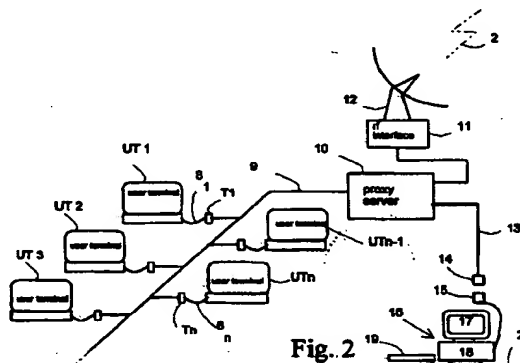
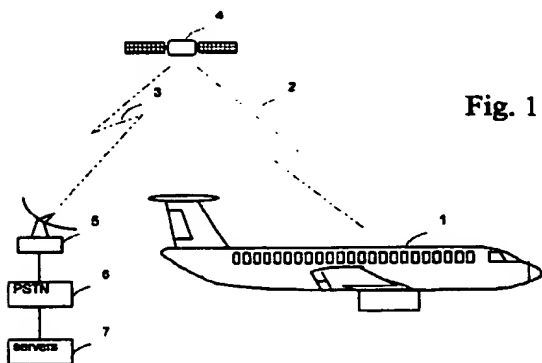


Fig. 1



## Description

The present invention relates to providing web access to a plurality of users in a vehicle, for example in a passenger vehicle such as an aircraft or a ship, and has particular but not exclusive application to providing access to the Internet.

Access to computer networks such as the Internet and in particular the worldwide web, can now readily be achieved by mobile users through the use of lap top computers and modems, and more recently, personal organisers provided with Internet access software, such as a web browser.

It would be desirable to provide Internet access to passengers on vehicles such as aircraft or ships. This could be done simply by connecting all the users on the vehicle via a local network to a router on board the vehicle, which would send data across a wireless link such as a satellite. However, this is an inherently costly solution because the wireless capacity is limited and usually expensive.

Proxy servers have been developed for local area networks to provide a common gateway from the network to the Internet. Thus, Internet traffic to the local area network is routed through a common gateway which caches all the pages that have been accessed by the users on the network, in order to reduce the delay to the user. For example, a proxy server is marketed by Microsoft Corporation. The proxy server has the advantage of reducing the bandwidth required for Internet access.

It would be possible to use a proxy server on a vehicle such as an aircraft but nevertheless the bandwidth of the satellite link would provide severe restrictions on the access time when a user accesses a web page through the satellite link.

The present invention seeks to overcome these difficulties.

In accordance with the invention from a first aspect there is provided a method of providing web access to a plurality of users in a vehicle, wherein the vehicle is provided with a web server for communication with the users, and means for providing a wireless link from the server to the web for use whilst the vehicle is in motion, the method comprising downloading into the web server in the vehicle, whilst it is stationary, at least one pre-selected web page to be accessed by the users during a journey in the vehicle.

Thus, in accordance with the invention, the web server in the vehicle can be selectively loaded with a number of web pages that are commonly accessed by users during a particular journey whilst the vehicle is stationary and in proximity to a large bandwidth, low cost data source. The, the downloaded pages may be selected according to the destination of the journey. In this way, large numbers of pages can be loaded onto the vehicle and access can be provided to the passengers without the need to make use of the wireless link,

thereby optimising access time for the users.

In the event that the user wishes to access a web page which has not been downloaded onto the server on the vehicle, access to the appropriate web site can be provided through the wireless link. However, the number of occasions for which the wireless link needs to be used, is reduced substantially in accordance with the invention.

The web server in the vehicle may be operative to store e-mail messages produced by users during the journey, and the method includes transmitting the stored messages from the vehicle whilst it is stationary, so as to reduce the load on the wireless link during the journey.

Use of the wireless link may be subject to a charge, whereas access of data from the web server on the vehicle, during the journey, may be free of charge or priced at a lower rate than the wireless link. The web server may be operative to accumulate billing information relative to usage of the web through the wireless link, and the billing information may be downloaded from the server on the vehicle, when the vehicle is stationary. Use of the wireless link may be charged to a credit card account or other means of billing.

The wireless link may comprise a satellite link, for example making use of a satellite telecommunications system. One example of such a system is the ICO™ system, aspects of which are described in patent publications WO 95/28747, WO 96/03814 and GB 2 295 296A. Other examples include the Inmarsat™ satellite system as described in "Satellite Communications : Principles and Applications" by Calcutt and Tetley, published 1994 by Edward Arnold, the Iridium™ satellite cellular system, described for example in EP-A-0365885, and the Odyssey™ system described for example in EP-A-0510789, EP-A-0575678 and EP-A-0648027.

The invention also includes a passenger vehicle provided with access to a web, comprising a proxy server, a local network within the vehicle to provide access to the proxy server for passengers in the vehicle, a transceiver for providing a wireless link from the proxy server to the web for use whilst the vehicle is in motion, and an input connection to permit the downloading into the proxy server, of preselected pages for access by the users during a journey in the vehicle.

Furthermore, the invention includes a device for downloading data into the proxy server of the vehicle, comprising a store of web pages categorised according to the destination of the vehicle, an output for downloading the pages into the proxy server in the vehicle, and user operable selecting means for inputting the vehicle's destination such that the pages categorised for the selected destination are downloaded into the proxy server.

From the foregoing, it can be seen that the invention may be broadly considered as a passenger vehicle provided with Internet access, comprising a proxy server,

and a local network within the vehicle to provide access to the proxy server for passengers in the vehicle.

In order that the invention may be more fully understood and embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a schematic view of a passenger aircraft provided with Internet access, in accordance with the invention, with a wireless link provided via a satellite telecommunications system, and

Figure 2 is a schematic block diagram of a local area network provided on the vehicle shown in Figure 1.

Referring to Figure 1, a passenger aircraft 1 is provided with Internet access through a wireless link 2, 3 via a satellite 4 which forms part of a satellite communication system, for example the ICO™ system as described in [ ]. The wireless link comprises an uplink 2 to the satellite 4 and a downlink 3 to a satellite earth station 5 which is connected through a public switch telephone network (PSTN) 6 or a public switched public data network (PSPDN) not shown, to servers which provide web sites for the Internet in a manner well known *per se*. For a general review of the Internet, the worldwide web and hypertext mark up language which is used to support the web, reference is directed to HTML 3.2 & CGI Unleashed, John December and Mark Ginsburg, Part 1, pp 4 - 53, Sams.net Publishing 1996.

It will be understood that the Internet consists of a plurality of servers which support web sites that include a plurality of web pages. Web pages are identified by uniform resource locators (URLs) and links between various web pages can be established through hotspots on the individual web pages.

Users can access web pages using web browser software such as the Netscape browser or the Microsoft Explorer. This software is typically run on a user's personal computer connected to the Internet through a modem. For mobile users, a laptop PC and modem may be used. Alternatively, a personal organiser capable of running web browser software may be used for Internet connection. In addition, in a conventional manner, the mobile user apparatus may be used to send and receive e-mail messages.

As previously mentioned, it is known to provide a gateway from a local area network of PCs, to the Internet through a device known as a proxy server. The proxy server permits a single modem to be used to provide Internet access for all PCs connected to the local area network. Furthermore, the proxy server is configured to cache access web pages so that when a particular web is accessed on a second occasion, the previously cached version can be used in order to reduce the time taken to download the page. A typical example of a proxy server is the proxy server marketed by Microsoft Corporation.

Referring now to Figure 2, the aircraft includes an Internet access point in the rear of each passengers' seat in order to allow passengers to connect their lap top computers or personal organisers, hereinafter referred to as user terminals, to the Internet. In Figure 2, user terminals UT 1 - UT n are shown connected via leads 8<sub>1</sub> - 8<sub>n</sub> to terminal points T1 - Tn to a local, cable connection 9 which communicates with a proxy server 10. The local connection 9 may comprise a coaxial cable, a twisted cable pair or alternatively an infrared connection or any other communication medium suitable for a local area network, known to those skilled in the art.

The proxy server 10 is connected to r.f. interface circuits 11 which drive a satellite antenna 12, which communicates with the satellite 4 shown in Figure 1.

Also, the proxy server 10 is connected through a wired link 13 to an output terminal 14 which, when the aircraft is stationary on the ground, between flights, can be coupled to a ground-based server 15 through terminal 16. The ground-based server 15 may comprise a personal computer which, in a conventional manner may include a display screen 17, a processor 18 including disc storage and a keyboard 19.

The store 18 of the ground-based server 15 stores web pages categorised according to the destination of the aircraft. The keyboard 19 can be used to select the web pages categorised for a particular destination. The selected web pages can then be downloaded into the proxy server 10 when the aircraft on the ground, in transit by connecting the terminal 16 to terminal 14 on the aircraft, to enable the selected web pages to be downloaded through the wired connection 13 to the proxy server.

When the aircraft is in flight, travelling towards the selected destination, individual users can connect their user terminals UT to the local area network on the aircraft, so as to be connected through relevant terminals T to the cabling 9 that is connected to the proxy server 10. The users can use the web browsers on their individual user terminals to select web pages stored in the proxy server 10. These web pages are available free of charge in this example. Also, if the users wish to access web pages at sites other than the proxy server 10, this can be achieved through the rf interface 11 and satellite antenna 12, making use of the wireless link 2, 3 through the satellite network, to the receiving station 5, which provides access to the servers 7 that form part of the Internet. However, because a large number of frequently used web pages, specific to the journey to the selected destination are loaded on the proxy server 10, demand by users for access through the wireless link 2, 3 is reduced, thereby reducing demand for bandwidth.

Additionally, the proxy server operates in the conventional manner to cache web pages accesses through the wireless link 2, 3 in order to minimise access time for subsequent re-use by any one of the users through the network 9.

When a user requests Internet access through the wireless link 2, 3, the proxy server 10 prompts the user for information concerning a credit card account so that the proxy server can accumulate billing information to be charged to the credit card account. When the aircraft lands, the billing information together with the credit card details are downloaded through the wired link 13 to the ground-based server 15, which subsequently downloads the billing information to credit card billing computers through link 20.

The described system also provides a novel way of handling e-mail messages. During the flight, the users, through their user terminals UT, can produce and send e-mail messages, which are temporarily stored in the proxy server 10. When the aircraft lands, in transit, the e-mail messages are downloaded through the wired link 13 to the server 15 on the ground, which subsequently downloads the e-mail messages through the conventional, ground-based link 20, for onward transmission.

The e-mail messages and web page requests may be allocated different priorities. For example, if an individual user, during the flight wishes to send an e-mail message with a high priority, the usual message storage facility will be overridden and the e-mail message will be sent via the wireless link, 2,3, through the satellite network. Using the high priority facility would incur a charge to the users credit card account

Whilst the invention has been described in relation to a passenger aircraft, it will be understood that it is applicable to other vehicles, such as ships, trains and other public and private means of transport.

## Claims

1. A method of providing web access to a plurality of users in a vehicle, wherein the vehicle is provided with a web server for communication with the users, and means for providing a wireless link from the server to the web for use whilst the vehicle is in motion, the method comprising downloading into the web server in the vehicle, whilst it is stationary, at least one pre-selected web page to be accessed by the users during a journey in the vehicle.
2. A method according to claim 1 wherein the or each downloaded page is selected depending on the destination of the journey.
3. A method according to claim 1 or 2 wherein the web server in the vehicle is operative to store e-mail messages produced by the users during the journey, and the method includes transmitting the stored messages from the vehicle whilst it is stationary.
4. A method according to claim 3 including storing e-mail messages produced by the users during the journey, for transmission subsequently when the vehicle is stationary.
5. A method according to any preceding claim wherein the wireless link is provided through a satellite telephone network.
6. A method according to claim 5 including receiving at a land based station, e-mail messages or web page requests transmitted from the vehicle through the satellite telephone network.
7. A method according to any preceding claim wherein the web server is operative to accumulate billing information relating to usage of the web through the wireless link, and including downloading the billing information from the server whilst the vehicle is stationary.
8. A method according to claim 7 including accumulating the billing information for usage of the web through the wireless link, during the journey.
9. A method according to claim 8 including storing user credit data during the journey, such that usage of the web through the wireless link can be charged to individual credit card accounts by virtue of the downloading of the billing information.
10. A method according to any preceding claim including attributing at least one different priority to web page requests produced by users during the journey, and utilising the wireless link only for the requests which have a predetermined priority
11. A method according to any preceding claim including communicating data to and from the web server through a link selectively connectible to the server when the vehicle is stationary.
12. A passenger vehicle provided with access to a web, comprising a proxy server,
  - a local network within the vehicle to provide access to the proxy server for passengers in the vehicle,
  - a transceiver for providing a wireless link from the proxy server to the web for use whilst the vehicle is in motion, and
  - an input connection to permit the downloading into the proxy server, of preselected pages for access by the users during a journey in the vehicle.
13. A vehicle according to claim 12 wherein the local network includes a plurality of inputs which permit passengers to connect mobile user terminals to the proxy server.

14. A vehicle according to claim 12 or 13 wherein the transceiver means is operative to provide the wireless link through a satellite telephone network.

15. A vehicle according to any one of claims 12 to 14  
including a store operative to store e-mail messages generated by users during the journey, and a downloading port for downloading the stored messages from the vehicle whilst it is stationary, for onward transmission.

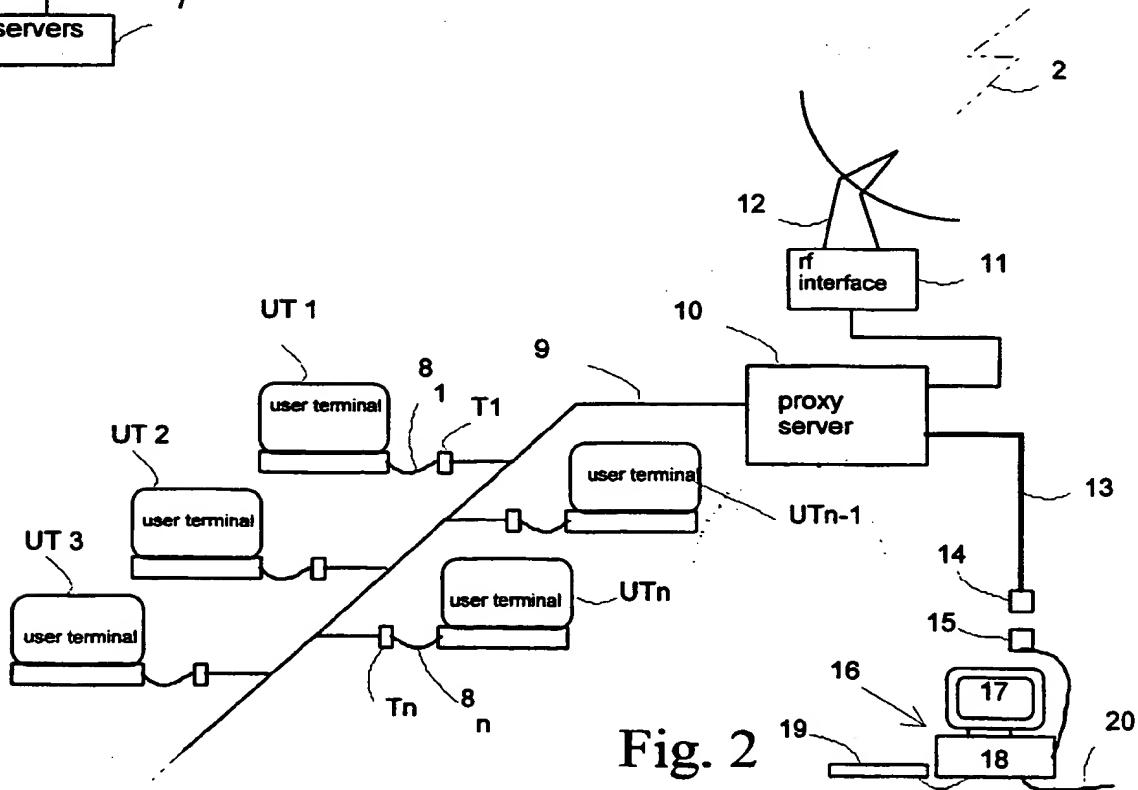
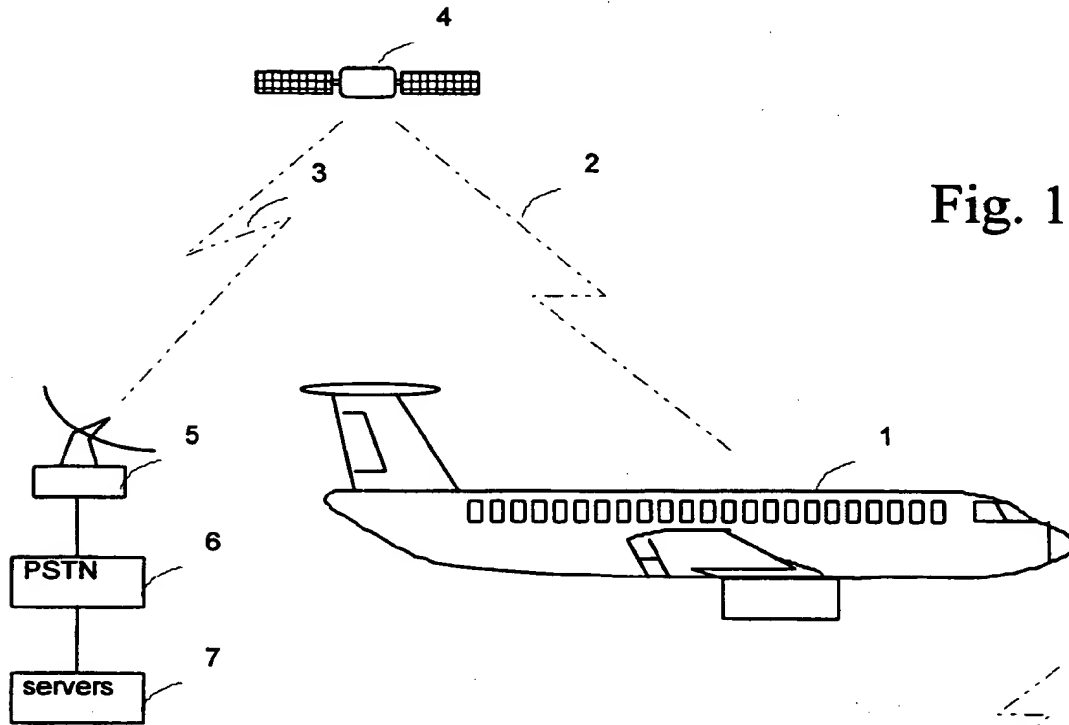
16. A vehicle according to any one of claims 12 to 15 wherein the proxy server is operative to cache web pages accessed by users in the vehicle.

17. A device for downloading data into the proxy server of the vehicle claimed in any one of claims 12 to 16, comprising:

a store of web pages categorised according to the destination of the vehicle, an output for downloading the pages into proxy server in the vehicle, and  
user operable selecting means for inputting the vehicle's destination such that the pages categorised for the selected destination, are downloaded to the proxy server.

18. A passenger vehicle provided with Internet access, comprising

a proxy server, and  
a local network within the vehicle to provide access to the proxy server for passengers in the vehicle.





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# EUROPEAN SEARCH REPORT

Application Number  
EP 97 30 5153

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The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 18 December 1997	Examiner Nicholls, J
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

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Application Number  
EP 97 30 5153

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	SATYANARAYANAN M ET AL: "EXPERIENCE WITH DISCONNECTED OPERATION IN A MOBILE COMPUTING ENVIRONMENT" PROCEEDINGS OF THE USENIX MOBILE AND LOCATION-INDEPENDENT COMPUTING SYMPOSIUM, 2 August 1993, pages 11-28, XP000575485 * the whole document *	1-18	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Place of search BERLIN		Date of completion of the search 18 December 1997	Examiner Nicholls, J
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... &amp; : member of the same patent family, corresponding document</p>			

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A	<p>DATABASE INSPEC INSTITUTE OF ELECTRICAL ENGINEERS, STEVENAGE, GB Inspec No. 5446254, BUKHRES O ET AL: "Performance analysis of adaptive caching algorithms in mobile environments" XP002050672 * abstract *</p> <p>&amp; INFORMATION SCIENCES, NOV. 1996, ELSEVIER, USA, vol. 95, no. 1-2, ISSN 0020-0255, pages 1-27, -----</p>	1-18	
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The present search report has been drawn up for all claims			
Place of search <b>BERLIN</b>		Date of completion of the search <b>18 December 1997</b>	Examiner <b>Nicholls, J</b>
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p>		<p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>..... &amp; : member of the same patent family, corresponding document</p>	

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